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(54) Title: FAT OR OIL COMPOSITION

(57) Abstract: Described is a fat or oil composition which comprises at least 35 wt.% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid) ≥ 6. Usual intake of the fat or oil composition of the present invention as an edible oil makes it possible to reduce arteriosclerotic factors in blood, leading to the prevention of arteriosclerosis, furthermore, various degenerative diseases.

DESCRIPTION

FAT OR OIL COMPOSITION

TECHNICAL FIELD

The present invention relates to a fat or oil composition capable of reducing arteriosclerotic factors in blood when taken, similarly to a usual fat or oil, in the daily life.

BACKGROUND ART

Arteriosclerosis is a risk factor of various circulatory diseases such as hypertension and thrombosis. Arteriosclerosis is caused by hypercholesterolemia, formation of thrombus or the like. The state of a high total cholesterol level is generally called hypercholesterolemia. The cholesterol in blood is classified into HDL, LDL, VLDL and the like by specific gravity. Among them, LDL is a principal risk factor of arteriosclerosis, while HDL is said to be useful for the prevention of arteriosclerosis. It is therefore important to increase the HDL cholesterol level in blood for the prevention of arteriosclerosis.

On the other hand, local formation of thrombi in blood is also considered as one of the factors of arteriosclerosis. When the activity of plasminogen activator inhibitor type 1 (PAI-1) which serves to control

the production of plasmin, that is, fibrinolysin in blood is exasperated, the production of plasmin is suppressed and formation of thrombi tends to occur. It is therefore essential to lower the activity of PAI-1 for the prevention of arteriosclerosis.

With regards to arteriosclerosis, prevention by the daily dietary control is more important than treatment. There is accordingly a demand for a substance which can be taken easily in the daily life and at the same time, can reduce the above-described arteriosclerotic factor.

DISCLOSURE OF THE INVENTION

Paying attention to a diacylglycerol which is known to suppress a postprandial increase in the blood level of a neutral fat, the present inventors have investigated constituent fatty acids of the diacylglycerol and their influence on the HDL cholesterol level and PAI-1 activity. As a result, it has been found that a fat or oil composition has excellent HDL cholesterol elevating action and PAI-1 lowering action and is useful as an edible oil when there is a specific relationship among the kinds and amounts of the stereoisomers of the unsaturated fatty acid and the amount of the saturated fatty acid contained in the composition.

There is thus provided a fat or oil composition which

comprises at least 35 wt.% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid) $\geq$ 6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt.% based on the constituent fatty acids of said diacylglycerol.

In another aspect of the present invention, there is also provided a fat or oil processed food comprising the above-described fat or oil composition.

In a yet another aspect of the present invention, there are also provided an HDL-cholesterol-level elevating agent and PAI-1-activity lowering agent, each comprising the above-described fat or oil composition.

In a further aspect of the present invention, there are also provided use of the above-described fat or oil composition in the preparation of the HDL-cholesterol-level elevating agent, and use of the above-described fat or oil composition in the preparation of the PAI-1-activity lowering agent.

In a still further aspect of the present invention, there are also provided a method for elevating the HDL cholesterol level in blood and a method for lowering the activity of PAI-1, each of which comprises administering

the above-described fat or oil composition.

Intake of the fat or oil composition of the present invention usually as an edible oil makes it possible to reduce the blood level of an arteriosclerotic factor, leading to the prevention of arteriosclerosis and furthermore, various geriatric diseases.

BEST MODES FOR CARRYING OUT THE INVENTION

The fat or oil composition according to the present invention contains at least 35 wt.% (which will hereinafter be indicated simply as "%") of a diacylglycerol. From the viewpoints of effects for suppressing an increase in the blood level of a neutral fat, HDL cholesterol elevating action and PAI-1 lowering action, the diacylglycerol content is preferably at least 50%, with at least 60% being more preferred and with at least 80% being particularly preferred.

The constituent fatty acids of the diacylglycerol contained in the fat or oil composition of the present invention satisfy the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid) $\geq$ 6. When this weight ratio of [(cis) / (trans + saturated)] is less than 6, the HDL cholesterol elevating effects and PAI-1 lowering effects

both lower. The weight ratio of [(cis) / (trans + saturated)] is preferably at least 8 and more preferably at least 9. The amount of the trans-form unsaturated fatty acid not greater than 5% is particularly preferred and also the amount of the saturated fatty acid not greater than 5% is particularly preferred, each based on the amount of the constituent fatty acids of the diacylglycerol. From the viewpoints of productivity and tastiness, the weight ratio of [(cis) / (trans + saturated)] is preferably less than 20, with the most preferred weight ratio being 9.4 to 19.1. Examples of the cis-form unsaturated fatty acid include oleic acid, α-linoleic acid, α-linolenic acid, cis-dihomo-γ-linolenic acid, cis-arachidonic acid, cis-eicosapentaenoic acid and cis-docosahexanoic acid. The term "trans-form unsaturated fatty acid" as used herein means an unsaturated fatty acid having, in the molecule thereof, at least one trans-form double bond. Examples of the saturated fatty acids include palmitic acid, stearic acid and arachic acid. Fatty acids having 8 to 24 carbon atoms are preferred, with those having 16 to 22 carbon atoms being particularly preferred. As the diacylglycerol, either one of 1,2-diacylglycerol or 1,3-diacylglycerol can be employed, with the 1,3-diacylglycerol being particularly preferred.

A phytosterol is a component having effects for

lowering the cholesterol level and is contained in the conventional plant oil in an amount of about 0.05 to 1.2%. With a view to obtaining the cholesterol lowering effects equivalent to those of such a plant oil, the content of phytosterol is preferably at least 0.05%, with at least 0.3% being particularly preferred. The phytosterol content in the fat or oil composition containing a diacylglycerol differs depending on the preparation process of the composition. When a commercially available fatty acid obtained by distillation is used as a raw material, the phytosterol content in the composition inevitably lowers. In such a case, it is preferred to add a phytosterol to give an amount of 0.05% or greater. No particular limitation is imposed on the upper limit of the phytosterol content. For the purpose of attaining cholesterol reduction equal to that brought by the use of the conventional plant oil, the phytosterol content falling within a range of 0.05 to 1.2% is sufficient. When the more cholesterol level reduction is intended, at least 1.2% of phytosterol can be added. Examples of the phytosterol include phytosterols in the free form such as α-sitosterol, β-sitosterol, stigmasterol, campesterol, α-sitostanol, β-sitostanol, stigmastanol, campestanol and cycloartenol and esters thereof such as fatty acid esters, ferulic acid esters, and cinnamic acid esters.

The other components contained in the fat or oil composition of the present invention are a triacyl glycerol and a monoacyl glycerol. The monoacyl glycerol content not greater than 2%, particularly not greater than 1.5% is preferred. Most of the remaining part is composed of a triacyl glycerol.

The fat or oil composition according to the present invention can be prepared, for example, by subjecting fat or oil containing desired constituent fatty acids and glycerin to transesterification; or by acting lipase on a mixture of desired constituent fatty acids or ester thereof with glycerin, thereby carrying out esterification. The esterification using lipase is preferred for preventing isomerization during the reaction. Even in the esterification by using lipase, with a view to preventing isomerization upon purification after completion of the reaction, it is preferred to carry the purification under conditions mild enough not to cause isomerization of the fatty acids.

It is possible to incorporate, in the fat or oil composition of the present invention, a component contained in the conventional fat or oil composition, for example, an antioxidant such as tocopherol, ascorbyl palmitate, ascorbyl stearate, BHT, BHA or phospholipid and/or emulsifier such as sucrose fatty acid ester, polyglycerin

fatty acid ester or organic acid monoglyceride.

As described above, the fat or oil composition according to the present invention has HDL cholesterol elevating action and PAI-1 lowering action. Although the use of a diacylglycerol ordinarily causes an increase in the melting point compared with the use of a triacyl glycerol composed of the same fatty acids, the fat or oil composition according to the present invention is able to have a liquid form at room temperature, which brings about an advantage that it is usable widely as an edible oil. The fat or oil composition according to the present invention can therefore be used suitably as a cooking oil. It can also be used as an oil-in-water type processed food such as beverage, dessert, ice cream, dressing, topping, mayonnaise or barbecue sauce; a water-in-oil type processed food such as margarine or spread; or a processed food such as peanut butter, frying oil or shortening. In addition, it can be used for processed foods such as potato chips, snacks, cakes, cookies, pies, bread or chocolates; bakery mix; processed meat products; frozen entree; frozen foods; or the like.

A description will next be made of the application of the fat or oil composition of the present invention to a fat or oil processed food.

In the fat or oil processed food of the present

invention, the amount of the fat or oil (total amount of edible oil and diacylglycerol) in the food is 3 to 95% and the amount of phytosterol is at least 0.05% based on the total amount of the fat or oil. The diacylglycerol content in the fat or oil is at least 35%, more preferably at least 50%.

The term "fat or oil processed food" as used herein means a processed food obtained by adding, to the above-described fat or oil composition, the other food raw materials. The following raw materials are usable as components for the fat or oil processed food.

(1) Edible fats or oils

There is no particular limitation imposed on the edible fat or oil used in the present invention insofar as it is a commonly used edible fat or oil. Examples include natural animal or vegetable fats or oils; and processed fats or oils obtained by subjecting them to transesterification, hydrogenation, fractionation or the like. Preferred examples include vegetable oils such as soybean oil, rapeseed oil, rice bran oil, corn oil, sunflower oil, palm oil, palm kernel oil and coconut oil; and processed fats or oils thereof.

(2) Emulsifiers

There is no particular limitation imposed on the emulsifier insofar as it is commonly used for food.

Examples include sucrose fatty acid esters, sorbitan fatty acid esters, glycerin fatty acid esters, lecithin and decomposed product thereof; and proteins such as egg protein, soybean protein and milk protein and various proteins available therefrom by separation or hydrolysis.

(3) Thickeners

There is no particular limitation imposed on the thickener insofar as it is commonly used for food. Examples include xanthan gum, gellan gum, guar gum, carrageenan, pectin, tragacanth gum, polysaccharides such as various starches and proteins such as gelatin and albumen.

(4) Various seasonings such as salt, sugar and vinegar.

(5) Various spices and flavors.

(6) Various coloring matters.

(6) Antioxidants such as tocopherol and natural antioxidant components.

The preferred formulation examples of the present invention will hereinafter be described. It should however be borne in mind that the application of the fat or oil composition of the present invention is not limited by them.

1) Acidic oil-in-water type fat or oil processed food

· oil phase / water phase : 20/80 to 80/20

· amount of diacylglycerol: at least 35% (preferably

at least 50%) based on the amount of the fat or oil in the oil phase

· amount of phytosterol: at least 0.05% based on the amount of the fat or oil in the oil phase

· amount of emulsifier: 0.05 to 5%

· pH: 2 to 6.

The pH is adjusted by an organic acid such as citric acid or salt thereof, or an acidifier such as lemon juice. From the above-described materials, an acidic oil-in-water type fat or oil processed food such as dressing or mayonnaise which has HDL elevating effects and PAI-1 lowering effects and is free from problems in appearance, taste, texture and the like can be prepared in a conventional manner.

(Formulation Example) Mayonnaise

Water phase

Salt	3.0 parts by weight
Soft sugar	1.0
Seasoning (sodium glutamate)	0.5
Spice (mustard powder)	0.3
Yolk	14
Vinegar (10% acidity)	8
Thickener	0.5
Water	22.7

Oil phase

fat or oil composition A 50

2) Water-in-oil type spreadable fat or oil processed food

· oil phase / water phase : 90/10 to 10/90 (preferably 85/15 to 50/50)

· amount of diacylglycerol: at least 35% (preferably at least 50%) based on the amount of the fat or oil in the oil phase

· amount of phytosterol: at least 0.05% based on the amount of the fat or oil in the oil phase

· melting point of the fat or oil in the oil phase: 20 to 50°C (preferably 20 to 40°C).

From the above-described materials, a water-in-oil type spreadable fat or oil processed food which has HDL elevating effects and PAI-1 lowering effects and is free from problems in texture, spreadability and the like can be prepared in a conventional manner.

(Formulation Example) Spread

Oil phase

Fat or oil	69.3 (parts by weight)
Lecithin	0.1
Monoacyl glycerol	0.5
Flavor	0.1

Water phase

Water	28.4
Skim milk	0.3

Salt	1.3

* Fat or oil: fat or oil composition A: 70% / partially hydrogenated palm oil (IV=40): 30%, melting point: 34.8°C

3) Baked cakes

· amount of fat or oil: 10 to 40%

· amount of diacylglycerol: at least 35% (preferably at least 50%) relative to the amount of the fat or oil

· amount of phytosterol: at least 0.05% relative to the amount of the fat or oil

· flour: 20 to 65%

· sugar: 5 to 30%

· whole egg: 0 to 20%

· salt: 0.1 to 2%

· baking powder: 0 to 1%

From the above-described materials, various baked cakes such as short bread which have HDL elevating effects and PAI-1 lowering effects can be prepared in a conventional manner.

(Formulation Example) Short bread

Flour	60 (parts by weight)
Fat or oil composition A	10
Sugar	24.6
Salt	0.4
Whole egg	5

Example 1

The fatty acid obtained by hydrolysis of a commercially available soybean oil having a trans fatty acid content of 0.8% was winterized to reduce the content of the saturated fatty acid. The resulting fatty acid was reacted with glycerin at 40°C in the presence of a commercially available immobilized 1,3-specific lipase ("Lipozyme 3A"; product of Novo Nordisk A/S) as a catalyst. After the lipase preparation was filtered off, the residue was subjected to molecular distillation, followed by purification in a conventional manner, whereby a fat or oil composition A was obtained.

Example 2

The fatty acid obtained by hydrolysis of a commercially available rapeseed oil having a trans fatty acid content of 0.6% was reacted with glycerin at 40°C in the presence of a commercially available immobilized 1,3-specific lipase as a catalyst. After the lipase preparation was filtered off, the residue was subjected to molecular distillation, followed by purification in a conventional manner, whereby a fat or oil composition B was obtained.

Example 3

A fat or oil composition C was obtained by mixing the fat or oil composition A and fat or oil composition B at a ratio of 7:3.

Example 4

A fat or oil composition D was obtained by mixing the fat or oil composition A and a commercially available soybean oil at a ratio of 6:4.

Comparative Example 1

The fatty acid obtained by hydrolysis of a commercially available soybean oil having a trans fatty acid content of 2.5% was reacted with glycerin at 40°C in the presence of a commercially available immobilized 1,3-specific lipase as a catalyst. After the lipase preparation was filtered off, the residue was subjected to molecular distillation, followed by purification in a conventional manner, whereby a fat or oil composition E was obtained.

Comparative Example 2

The fatty acid obtained by hydrolysis of a commercially available rapeseed oil having a trans fatty acid content of 2.8% was reacted with glycerin at 40°C in the presence of a commercially available immobilized 1,3-specific lipase as a catalyst. After the lipase preparation was filtered off, the residue was subjected to molecular distillation, followed by purification in a conventional manner, whereby a fat or oil composition F was obtained.

The glyceride composition and constituent fatty acids

of the diacylglycerol of each of the fat or oil compositions obtained in Examples 1 to 4 and Comparative Examples 1 and 2, and a soybean oil (Comparative Example 3) are shown in Tables 1 and 2.

[Measurement of glyceride distribution]

Each of the fat or oil compositions was silylated by a silylating agent ("silylating agent TH", product of Kanto Chemical), followed by analysis through gas chromatography by using a capillary column ("DBTM-1", trade name; product of J&W Scientific Incorporated).

[Distribution of constituent fatty acids of diacylglycerol]

Diacylglycerol fractions in each of the fat or oil compositions were collected by column chromatogram [after the removal of the triglyceride fractions by using "Wakogel C-200" (product of Wako Pure Chemicals Co., Ltd.) and hexane, diacylglycerol fractions were obtained using a 70:30 mixed solvent of hexane and ether]. After methyl-esterification in a conventional manner, analysis was carried out by gas chromatography with a capillary column ("CP-SIL88", trade name; product of Chrompack International BV).

Table 1: Glyceride Composition (%)

Fat or oil composition	MG	DG	TG	Phytos-terol
A	1.0	85.5	13.1	0.4
B	1.2	84.7	13.1	1.0
C	0.9	85.1	13.4	0.6

D	0.6	51.8	47.2	0.4
E	0.9	83.1	15.7	0.3
F	1.3	81.9	15.9	0.9
Soybean oil	ND	1.0	98.7	0.3

Table 2: Composition of fatty acids (%)

Constituent fatty acids of diacylglycerol	Composition						Commercially-available soybean oil
	A	B	C	D	E	F	
C16	2.5	4.1	3.0	5.8	10.8	4.2	10.8
C18	0.8	2.1	1.2	2.2	4.2	2.1	4.2
C18:1 cis	27.8	60.9	37.7	26.4	24.4	56.8	24.4
trans	0.0	0.0	0.0	0.0	0.0	1.2	0.0
C18:2 cis	59.8	19.8	47.8	56.4	49.5	19.9	51.3
trans	0.6	0.3	0.5	0.5	2.2	2.6	0.3
C18:3 cis	6.7	8.4	7.2	6.7	4.0	6.0	6.7
trans	1.0	1.4	1.1	0.8	3.2	4.1	0.5
C2O	0.0	0.7	0.2	0.2	0.4	0.9	0.4
uk	0.8	2.3	1.2	1.0	1.3	2.2	1.4
trans	1.6	1.7	1.6	1.3	5.4	7.9	0.8
saturated	3.3	6.9	4.4	8.2	15.4	7.2	15.4
trans + saturated	4.9	8.6	6.0	9.5	20.8	15.1	16.2
cis	94.3	89.1	92.7	89.5	77.9	82.7	82.4
cis / (trans+saturated)	19.1	10.4	15.5	9.4	3.7	5.5	5.1

uk: unknown component

Test 1

Instead of the edible oil usually employed, each of the fat or oil compositions was used for three months. Daily intake of it was 12.5 g. Male and female adults, 10 in total, whose total cholesterol level tended to be high were tested. Effects, on the total cholesterol level and HDL cholesterol level, of each of the fat or oil compositions obtained in Examples and Comparative Examples are shown in Table 3. The effects are indicated by a value relative to the initial value set at 100. In each group, no change was observed from the total cholesterol level

before the test to that after the test.

Table 3

	Fat or oil composition	cis / (saturated + trans)	Total cholesterol level	HDL cholesterol level
Example 1	A	19.1	99.3	111.9
Example 2	B	10.4	100.1	109.8
Example 3	C	15.5	99.8	110.5
Example 4	D	9.4	100.3	108.2
Comp. Ex. 1	E	3.7	101.1	102.5
Comp. Ex. 2	F	5.5	98.9	103.0
Comp. Ex. 3	soybean oil	5.1	102.0	98.2

Test 2

Instead of the edible oil usually employed, each of the fat or oil compositions was used for three months. Daily intake of it was 12.5 g. Male and female adults, 8 in total, whose total cholesterol level tended to be high were tested. Effects, on PAI-1, of each of the fat or oil compositions obtained in Examples and Comparative Examples are shown in Table 4. The effects are indicated by a value relative to the initial value set at 100.

Table 4

	Fat or oil composition	cis / (saturated + trans)	PAI-1
Example 1	A	19.1	82.0
Example 2	B	10.4	85.7
Example 3	C	15.5	84.1
Example 4	D	9.4	87.9
Comp. Ex. 1	E	3.7	94.0
Comp. Ex. 2	F	5.5	93.1
Comp. Ex. 3	soybean oil	5.1	105.5

INDUSTRIAL APPLICABILITY

Usual intake of the fat or oil composition of the present invention as an edible oil makes it possible to reduce arteriosclerotic factors in blood, leading to the prevention of arteriosclerosis, furthermore, various degenerative diseases.

CLAIMS

1. A fat or oil composition which comprises at least 35 wt.% of a diacylglycerol, the constituent fatty acids of said diacylglycerol satisfying the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid) $\geq$ 6, wherein the amount of the trans-form unsaturated acid is not greater than 5 wt.% based on the constituent fatty acids of said diacylglycerol.

2. A fat or oil composition according to claim 1, which further comprises phytosterol in an amount not less than 0.05 wt.%.

3. A fat or oil composition according to claim 1 or 2, wherein the constituent fatty acids of said diacylglycerol satisfy the following equation: (an amount of a cis-form unsaturated fatty acid) / (an amount of a saturated fatty acid + an amount of a trans-form unsaturated fatty acid) $\geq$ 9.

4. A fat or oil composition according to any of claims 1 to 3, wherein the amount of the saturated fatty acid is not greater than 5 wt.% based on the constituent fatty acids of said diacylglycerol.

5. A fat or oil processed food comprising a fat or oil composition as claimed in any of claims 1 to 4.

6. An HDL-cholesterol-level elevating agent comprising a fat or oil composition as claimed in any of claims 1 to 4.

7. A PAI-1-activity lowering agent comprising a fat or oil composition as claimed in any of claims 1 to 4.

8. Use of a fat or oil composition as claimed in any of claims 1 to 4 in the preparation of an HDL-cholesterol-level elevating agent.

9. Use of a fat or oil composition as claimed in any of claims 1 to 4 in the preparation of a PAI-1-activity lowering agent.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A23D9/007 A61K31/23 A23L1/30

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A23D A61K A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ, BIOSIS, WPI Data, FSTA, CHEM ABS Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 32022 A (UNILEVER NV ;UNILEVER PLC (GB)) 17 October 1996 (1996-10-17) claims 1,4; examples 1,2	1,3,4
Y		2,6-9
P,Y	EP 0 990 391 A (KAO CORP) 5 April 2000 (2000-04-05) claim 1	2
A	WO 98 01461 A (CHAPUIS JEAN MARC ;JOUY NICOLAS (FR); MAUREL SANTE (FR); MAUREL JE) 15 January 1998 (1998-01-15) page 5, line 19-35 claims 1,17,19; examples 1,8	1-6,8

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search	Date of mailing of the international search report
16 November 2000	30.11.00

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 171 112 A (UNILEVER NV ;UNILEVER PLC (GB)) 12 February 1986 (1986-02-12) page 3, line 12-20 claim 1; example 5; table 2 ---	1,3-5
P,A	US 6 025 348 A (GOTO NAOHIRO ET AL) 15 February 2000 (2000-02-15) column 3, line 48 -column 4, line 45 ---	1-5
A	EP 0 836 805 A (KAO CORP) 22 April 1998 (1998-04-22) claims 1-10 ---	1-5
A	PATENT ABSTRACTS OF JAPAN vol. 012, no. 349 (C-529), 20 September 1988 (1988-09-20) & JP 63 104917 A (KAO CORP), 10 May 1988 (1988-05-10) abstract ---	1-5
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INTERNATIONAL SEARCH REPORT

International Application No
PCT/JP 00/05633

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	LING W H ET AL: "ENHANCED EFFICACY OF SITOSTANOL-CONTAINING VERSUS SITOSTANOL-FREE PHYTOSTEROL MIXTURES IN ALTERING LIPOPROTEIN CHOLESTEROL LEVELS ANDSYNTHESIS IN RATS" ATHEROSCLEROSIS,NL,AMSTERDAM, vol. 118, no. 2, 1995, pages 319-331, XP002044615 ISSN: 0021-9150 See Introduction abstract	6,8

INTERNATIONAL SEARCH REPORT

Internal application No.
PCT/JP 00/05633

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. [X] Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Although claims 6-9 are directed to a method of treatment of the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.

2. [ ] Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. [ ] Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. [ ] As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. [ ] As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

[ ] The additional search fees were accompanied by the applicant's protest.

[ ] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/JP 00/05633

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